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**PATENT APPLICATION**

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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Appl. No. : 10/762,672  
Applicant : Stephen N. Sanderson  
Filed : January 24, 2004  
Title : INSERTABLE PIANO/KEYBOARD STRIP FOR SENSING KEY MOVEMENT

Art Unit : 2837  
Conf. No. : 5156  
Examiner : Christina Russell

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Commissioner for Patents  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
ATTN: Board of Patent Appeals and Interferences

**BRIEF FOR APPELLANT**  
**UNDER 37 C.F.R. § 1.192**

(1) Real Party in Interest

The real party in interest is: The party named in the caption.

(2) Related Appeals and Interferences

There are no other appeals or interferences known to appellant or appellant's legal representative that will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

Claims 1-14 stand finally rejected.

(4) Status of Amendments

All amendments have been entered.

(5) Summary of Invention

The present invention is most easily understood from Fig. 1, which is a perspective cutaway view of a representative portion of a piano/keyboard and how the present invention would appear from atop of the keyboard (the perspective view illustrates an external vertical printed circuit board operatively connected to a sensing strip that inserts into the keyboard between the keys and underneath the fallboard).

As noted in the specification at page 6, lines 3-9, the present invention is inserted into the keyboard from atop the keys with sensing strip **21** inserted between the keys and the bottom side of fallboard **11**. Sensing strip **21** comprises a thin circuit board. Sensing strip **21** electrically connects to external circuit board **13** at a right angle. Circuit board **13** sits externally while sensing strip **21** is inserted and hidden from view. Once in place, the sensing devices rest over the top of their respective internal key surfaces. The profile of sensing strip **21** board and parts is extremely low, and because it is inserted between the back of the keys and the fallboard, no disassembly or reassembly of the piano is required (a disadvantage of the prior art noted at page 1, line 27, to page 2, line 4). An important embodiment of the invention relates to reflective flexible members **24** as seen in Figs. 3A and 3B.

The sole independent claim, claim 1, reads as follows: "A system for use with a piano, organ, or musical keyboard, comprising: an insertable sensor sensing either white key or black key movement or both white and black key movement, said sensor insertable between keys and a fallboard of the piano,

organ or keyboard, and said insertable sensor not requiring disassembly of the piano, organ or keyboard; and circuitry to process signals from said sensor and to process said key movement information." The insertable sensor corresponds to sensing strip **21**, and the circuitry to external circuit board **13**.

(6) Issues

(i) Whether claims 1-6, 8, and 10-13 are unpatentable under 35 U.S.C. § 102(b) as anticipated by U.S. Patent No. 4,790,230, to Sanderson ("`230 Patent");

(ii) Whether claim 7 is unpatentable under 35 U.S.C. § 103(a) over the `230 Patent in view of U.S. Patent No. 6,472,589, to Lee ("Lee");

(iii) Whether claim 9 is unpatentable under 35 U.S.C. § 103(a) over the `230 Patent in view of U.S. Patent No. 5,237,125, to Fields ("Fields"); and

(iv) Whether claim 14 is unpatentable under 35 U.S.C. § 103(a) over the `230 Patent in view of U.S. Patent No. 4,818,132, to Brull ("Brull").

(7) Grouping of Claims

Appellants consider that dependent claims 2-3, 6-11, and 14 are separately patentable and do not stand or fall with independent claim 1 or any other rejected claim.

(8) Argument

(i) Claims 1-6, 8, and 10-13 are patentable under 35 U.S.C. § 102(b) over U.S. Patent No. 4,790,230, to Sanderson ("`230 Patent").

The Examiner rejected claims 1-6, 8, and 10-13 under 35 U.S.C. § 102(b) as being unpatentable over the `230 Patent. The Examiner states that Sanderson discloses a system for a keyboard like instrument comprising an insertable sensor strip that is placed at the back of the keys. This is not what is

being claimed in the present invention, which disposes a "sensor insertable between keys and a fallboard of the piano".

The `230 Patent discloses an apparatus removably positionable atop a back portion of the keyboard of the instrument. The `230 Patent apparatus is removable and positionable atop the back portion of the keyboard, but not insertable between the keys and the fallboard as claimed in the present invention. Consequently, the apparatus described by the `230 Patent does not disclose the insertable sensor of the present invention.

Further, trying to use the `230 Patent apparatus for insertion into the piano would require taking apart the piano or other keyboard because of the width of the apparatus. However, it makes no sense to do so in any event because the `230 Patent device is intended to sit atop the keys. Applicant's present invention requires no disassembly and does not sit atop the keys. Accordingly, the `230 Patent not only does not teach the present invention but teaches away from it in this aspect.

Dependent claims 2-3, 6, 8, and 10-11 are also separately patentable.

Claim 2 is directed to a sensor for sensing movement of a portion of the key hidden from view. This is enabled by the placement of the sensor between the keys and the fallboard. Portions of the keys that are out of sight can thus be sensed. The `230 Patent apparatus cannot do this, as it sits atop the back of the keys.

Claim 3, dependent from claim 2, is directed to use of one or more sensors per key to sense a proportional amount of hidden key movement. Again, the `230 Patent cannot sense the hidden portions of the keys.

Claim 6, dependent from claim 2, relates to the sensing strip being operatively connected to a flexible strip that moves in relation to an associated key and provides energy to said sensing strip that is proportional to an amount of said key movement. This relates to reflective flexible member **24** as seen in Figs. 3A and 3B. The `230 Patent does not comprise such a flexible member, but rather a rigid apparatus that sits entirely atop the keys.

Claim 8, dependent from claim 6, provides that the sensing strip and the flexible strip comprise a capacitively coupled emitter and receiver that converts an electric field strength to a corresponding electrical signal proportional to a displacement of the key. Being able to do this with a flexible strip is neither taught nor suggested by the '230 Patent.

Claim 10, dependent from claim 6 provides that the sensing strip and the flexible strip comprise two or more electrical contact point pairs electrically biased that close when the key is at rest and open sequentially as the key is depressed. Again, being able to do this with a flexible strip is neither taught nor suggested by the '230 Patent.

Claim 11, dependent from claim 6, states that the sensing strip and the flexible strip comprise two or more optical coupler switches electrically biased that are switched on when the key is at rest and open sequentially as the key is depressed. Yet again, being able to do this with a flexible strip is neither taught nor suggested by the '230 Patent.

- (ii) Claim 7 is patentable under 35 U.S.C. § 103(a) over the '230 Patent in view of U.S. Patent No. 6,472,589, to Lee ("Lee").

Claim 7, dependent from claim 6, relates to the sensing strip and the flexible strip comprising a magnetically coupled emitter and receiver that converts a magnetic field strength to a corresponding electrical signal proportional to a displacement of the key. Again, the '230 Patent is deficient in showing that a flexible strip can be employed for any purpose, and Lee does not cure this deficiency.

- (iii) Claim 9 is patentable under 35 U.S.C. § 103(a) over the '230 Patent in view of U.S. Patent No. 5,237,125, to Fields ("Fields").

Claim 9, dependent from claim 6, relates to the flexible strip comprising a piezo-electric strip that converts mechanical energy to a negative or positive electrical signal proportional to a pressure by which the key is depressed or released. Again, the '230 Patent is deficient in showing that a flexible strip can be

employed for any purpose. Fields relates to piezoelectric films laminated to a mylar backing material. However, combining the two references is nonsensical because the apparatus of the `230 Patent is mounted atop the keys, whereas the Fields device operates beneath the keys.

- (iv) Claim 14 is patentable under 35 U.S.C. § 103(a) over the `230 Patent in view of U.S. Patent No. 4,818,132, to Brull ("Brull").

Claim 14, dependent from claim 1, relates to the sensor further comprising an insertable protector to protect the sensor from ambient light interference. The reflective couplers of the `230 Patent are inherently protected from ambient light by being placed within the keyboard mold of the device, and so there is no incentive to combine that invention with references such as Brull that show ambient light shields.

(9) Conclusion

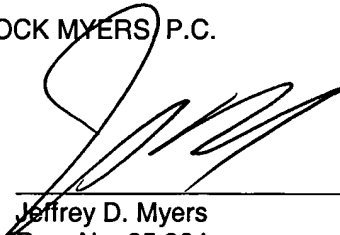
The rejected claims are patentable over the prior art. Reversal of the Examiner's rejections is respectfully requested.

(10) Appendix (Attached).

Respectfully submitted,

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## CLAIMS APPENDIX

### Claims

Claim 1 (previously presented): A system for use with a piano, organ, or musical keyboard, comprising:

an insertable sensor sensing either white key or black key movement or both white and black key movement, said sensor insertable between keys and a fallboard of the piano, organ or keyboard, and said insertable sensor not requiring disassembly of the piano, organ or keyboard; and  
circuitry to process signals from said sensor and to process said key movement information.

Claim 2 (previously presented): The system of claim 1 wherein said insertable sensor detects key depression and said system further comprises a sensing strip operatively connected to said sensor for sensing movement of a portion of the key hidden from view.

Claim 3 (original): The system of claim 2 wherein said sensing strip operatively connects to one or more sensors per key to sense a proportional amount of hidden key movement.

Claim 4 (previously presented): The system of claim 1 wherein said sensor comprises an energy contact and a corresponding energy receiving contact that by itself or when combined with another sensor produces an electrical signal strength proportional to said key movement of the key.



Claim 5 (original): The system of claim 4 wherein said energy contact comprises an optical emitter and an optical receiver that converts reflected optical energy provided by a key surface to an electrical signal proportional to displacement of the key.

Claim 6 (previously presented): The system of claim 2 wherein said sensing strip is operatively connected to a flexible strip that moves in relation to an associated key and provides energy to said sensing strip that is proportional to an amount of said key movement.

Claim 7 (original): The system of claim 6 wherein said sensing strip and said flexible strip comprise a magnetically coupled emitter and receiver that converts a magnetic field strength to a corresponding electrical signal proportional to a displacement of the key.

Claim 8 (original): The system of claim 6 wherein said sensing strip and said flexible strip comprise a capacitively coupled emitter and receiver that converts an electric field strength to a corresponding electrical signal proportional to a displacement of the key.

Claim 9 (original): The system of claim 6 wherein said flexible strip comprises a piezo-electric strip that converts mechanical energy to a negative or positive electrical signal proportional to a pressure by which the key is depressed or released.

Claim 10 (original): The system of claim 6 wherein said sensing strip and said flexible strip comprise two or more electrical contact point pairs electrically biased that close when the key is at rest and open sequentially as the key is depressed.

Claim 11 (original): The system of claim 6 wherein said sensing strip and said flexible strip comprise two or more optical coupler switches electrically biased that are switched on when the key is at rest and open sequentially as the key is depressed.

Claim 12 (original): The system of claim 1 wherein said circuitry further processes key-note velocity.

Claim 13 (previously presented): The system of claim 1 wherein said circuitry transmits at least key-note ON/OFF information.

Claim 14 (previously presented): The system of claim 1 wherein said sensor further comprises an insertable protector to protect said sensor from ambient light interference.

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**EVIDENCE APPENDIX (Not Applicable)**

RELATED PROCEEDINGS APPENDIX (Not Applicable)